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ABSTRACT

Shadow netWorkspace[TM](SNS) is designed and developed as a free, open source, network-based work environment specifically for use in K-12 schools to support schools and learning. This paper describes a learning module utilizing features of SNS and articulates how teacher and students can collaboratively learn and work to build knowledge. The paper also proposes a collaborative knowledge building model that illustrates the significant phases in the learning module. Teachers in the local community are invited to evaluate the feasibility of learning module in terms of its benefits, challenges, the ease and appropriateness of use. Feedback from the evaluation will provide recommendations for the design and development of knowledge building activities. (Contains 18 references and 1 figure.) (Author)

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Collaborative Knowledge Building: A Learning Module in Shadow netWorkspace™ Learning System

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Abstract: Shadow netWorkspace™ (SNS) is designed and developed as a free, open source, network-based work environment specifically for use in K-12 schools to support schools and learning. In this paper, we describe a learning module utilizing features of SNS and articulate how teacher and students can collaboratively learn and work to build knowledge. The paper also proposes a collaborative knowledge building model that illustrates the significant phases in the learning module. Teachers in the local community are invited to evaluate the feasibility of learning module in terms of its benefits, challenges, the ease and appropriateness of use. Feedback from the evaluation will provide recommendations for the design and development of knowledge building activities.

SNS Learning Communities

Shadow netWorkspace™ (SNS) is an Open Source, network-based work environment designed and developed for use in K-12 schools by the Center for Technology Innovations in Education (CTIE) at the University of Missouri-Columbia. Open Source licensing provides a new framework for the development and evolution of software systems, and network-based learning systems enable schools to change from knowledge-acquisition institutions to knowledge-building learning communities (Laffey et al. 1999). Specifically SNS has developed a network-based software system and is building a community of developers committed to open source licensing and the SNS learning system.

We utilize features of SNS to build collaborative learning modules. They are designed to gain participation of an extended community of researchers, teachers, administrators, and tech coordinators in an effort to gain better understanding of network-based learning systems and their potential impact. Collaboration could happen in two main areas: 1) development and refinement of learning modules, and 2) research and assessment of learning modules. Because a widespread use of technology is to promote learning and facilitate lesson plans, these collaborative efforts can build the body of learning modules available to teachers as well as the information about the utility and efficacy of those modules.

Scardamalia and Bereiter (1993) describe how computer-supported collaborative learning (CSCL) systems can support and optimize both the process and the representation of knowledge-building, learning and collaboration. SNS provides a means for both educators and software developers to create sharable and continuously-improving software that can be easily and flexibly integrated to a local learning community.

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Therefore, rather than a rigid learning application, SNS is more likely an adaptable operating system for collaboration and learning.

A Learning Module in SNS

Objectives and Method Review

One collaborative learning module is a note taking and critiquing module that outlines methods for using SNS to facilitate collaborative knowledge building. The objective of this module is to improve students' note taking and critical analysis skills and to encourage effective integration with the content lessons.

Each week, different students are assigned to be the "note-posters". They are responsible for taking their best notes for that given week and posting them into appropriate documents (Shadowdoc) to collaborate and brainstorm within their science class group. Each night, each member of the class is assigned to critique a manageable number (1-3 depending on volume) of note-sets by comparing the posted sets to their own and commenting via the discussion boards. Friday is review day. The class works together to guide the instructor (and vice versa) through the process of combining the note-sets into one document that represents all the key points that the instructor wanted to get across as well as the areas of detail that should be included. This final document could be used for preparing unit assessment.

This exercise aims to create a "progressive discourse" between the students and the instructor. This discourse embodies the concept of formative evaluation within the context of a knowledge-building task (Scardamalia & Bereiter, 1996a). Thinking can be shaped by writing and people tend to think more and write more clearly when they are producing content for others. Critical thinking happens in good discussions. For years, proponents of Writing-Across-the-Curriculum (WAC) have been saying that students learn when they formulate their ideas in writing (Lang, 2000). Writing is reviewable, revisable, and recorded. This effort to optimize the process of building expertise, requires students to be intentional learners. Analyzing their knowledge and organizing new information, with the understanding that their words will be under the scrutiny of their peers, should encourage thoughtfulness and learning. As the students contribute to build a collective knowledge, they will be required to adapt both their intentions and their methods. As they gain understanding they must quickly switch roles from learner to teacher, so that they can help their peers to learn and improve the group artifacts.

Assessment

Assessment of a collaborative activity might be the biggest challenge for teachers when using this teaching method. The reason why it is so difficult to evaluate collaboration is that teachers have to examine not only the process but also the final product of a group's work.

This learning module is intended to fit into a traditional curriculum, so the weekly note-sets could serve as review materials for quizzes or examinations. Concept-mapping assessment could be used as an alternative assessment method. A concept map is a node-link-node representation of content, where nodes represent concepts and links represent relationships between connected concepts (Dansereau, 1995; Jonassen, Beissner, & Yacci, 1993). When large numbers of concepts are connected, a concept map is formed which ideally represents the content and the structure of a student's knowledge framework. For a group of students, concept maps can be viewed as expressing the meaning shared by team members. The concept maps can be scored for (a) number of unique nodes, (b) number of links between nodes, and (c) number of levels based on adaptions of concept map scoring procedures (Ayersman, 1995; Novak & Gowin, 1984; Toro, 1995). As learning occurs from instruction, the growth of learners' knowledge should be reflected in the elaborateness and structure of the notes they construct (Jonassen, 1987). Analyzing the complexity and accuracy of pre- versus post-lesson concept maps can illustrate depth of students' understanding.

Learning and Knowledge Building in SNS

The Knowledge Building pedagogy envisions learning as a social process of collaboration that students can become active learners and more aware of their own and others' processes of constructing knowledge (Brown & Campione, 1994; Scardamalia & Bereiter, 1996b; Pea, 1993). This note-taking learning module, the significant phases of collaborative knowledge building are illustrated in Figure 1: cycles of personal understanding and collaborative knowledge building. This figure represents the processes of internal personal understanding, and socio-cultural knowledge building. This model illustrates the environment where individual's understanding can be adapted and enhanced collaboratively.

SNS Support for Social Knowledge Building Activities

Network-based learning system cannot provide support for individual cognition; Individuals must articulate their understanding and beliefs as public statements before they can interact within network-based learning system. Thoughts must be even more formalized for computer support than for interpersonal interaction (Stahl, 1993). In this module, students can use Shadowdoc to create documents with sections and images and to compile the class notes. The full-featured discussion board in SNS could also be used for representation and interaction.

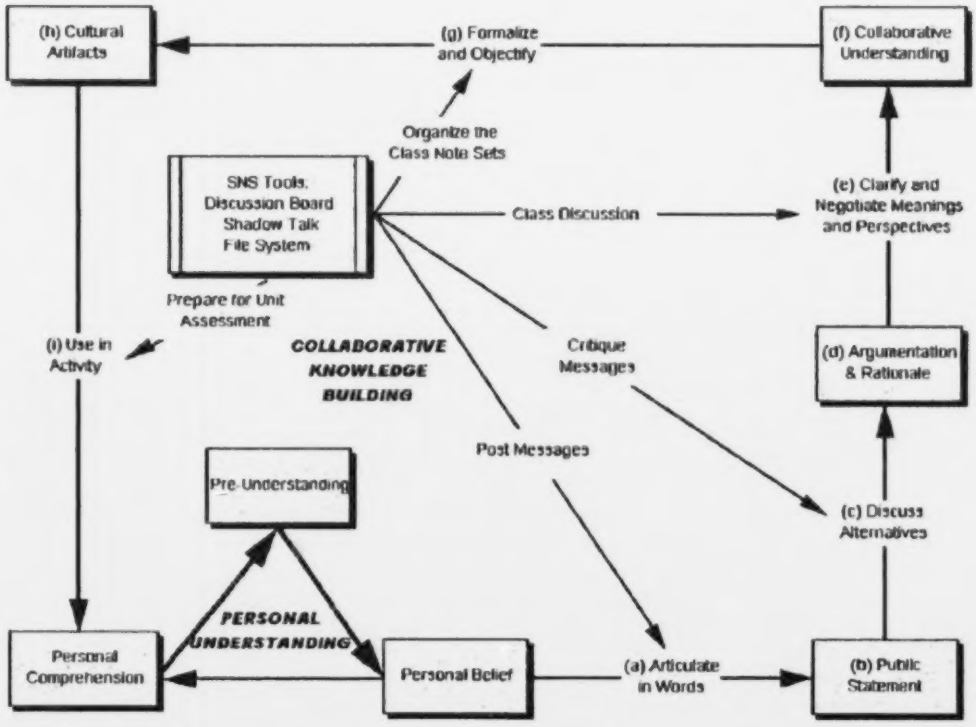

Figure 1: Collaborative Knowledge Building Using SNS Tools (adapted from Stahl, 2000)

(a) ***Articulate in Words*** – SNS tools will facilitate the process of articulating ideas and preserving them in convenient forms. Posting notes will encourage the users to "verbalize" their thoughts in an appropriate expression and accumulate the text to the public statements.

(b) ***Public Statements*** – Public statements are the domains where one person confronts other people's perspectives. Posted notes can represent the different perspectives from which these statements emerge. It also makes explicit the important relationships among personal and group perspectives, as

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well as providing meanings for individuals and collaborative teams to articulate their own perspectives. The instructor or other users can co-construct and add/edit commentary or critiques on writing documents.

(c) ***Discuss Alternatives*** – The SNS tools provide an asynchronous, interactive communication that allows students to respond to notes posted by others. Unlike a tree of divergent opinions, the Shadowdoc or a scaffolded discussion forum can go beyond superficial aimless discussion to converge on shared understandings and acknowledged opinions (dePaula, 1998; Guzdial & Turns, 2000; Hewitt & Teplovs, 1999; Stahl, 2000).

(d) ***Argumentation & Rationale*** – One note might be against another or provide evidence to support the claim of another note. Donath et al. (1999) suggested the component that supported argumentation and rationale could contribute to participants' meta-level comprehension of their knowledge-building process.

(e) ***Clarify and Negotiate Meanings and Perspectives*** – Constructing group knowledge can be fostered by clarifying the meaning of important terms or key concepts (Stahl, 2000). The key concept discussion can make explicit how different participants understand the terms they use and should result in a group glossary of the agreed upon definitions of important terms. After the processes of clarification and negotiation, the key concepts or glossary could become the future debate or the topics for the assessment.

(f) ***Collaborative Understanding*** – The accumulation of negotiated-shared knowledge results in the establishment of a group perspective. Individuals can then build on this shared knowledge within their own perspective and even begin to critique it and start the whole cycle over.

(g) ***Formalize & Objectify into Cultural Artifacts and Representations*** – The shared knowledge can be further formalized. It can be represented in another symbolic system or combined into a more comprehensive system of knowledge. For example, the class can build a note-set to outline the key concepts of the unit. The note-set will provide the accepted base for building future knowledge. Other artifacts could include an annotated bibliography, like a knowledge repository.

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